Basic & advanced turf nutrition with MLSN

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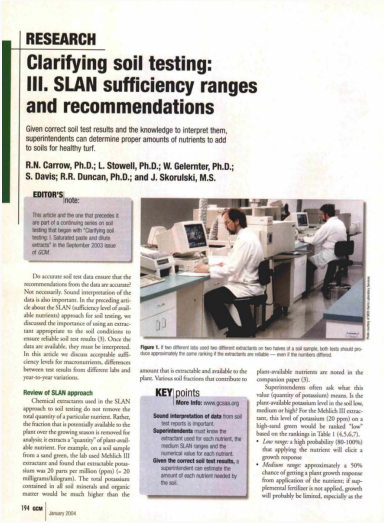
The conventional way – low, medium, & high classification

The conventional way



RESEARCH

Clarifying soil testing: III. SLAN sufficiency ranges and recommendations

Given correct soil test results and the knowledge to interpret them, superintendents can determine proper amounts of nutrients to add to soils for healthy turf.

R.N. Carrow, Ph.D.; L. Stowell, Ph.D.; W. Gelernter, Ph.D.; S. Davis; R.R. Duncan, Ph.D.; and J. Skorulski, M.S.

EDITOR'S note:

This article and the one that precedes it are part of a continuing series on soil testing that began with "Clarifying soil testing I: Saturated paste and dilute extracts" in the September 2003 issue of *GCM*.

Do accurate soil test data ensure that the recommendations from the data are accurate? Not necessarily. Sound interpretation of the data is also important. In the preceding article about the SLAN (sufficiency level of available nutrients) approach for soil testing, we discussed the importance of using an extractant appropriate to the soil conditions to ensure reliable soil test results (3). Once the data are available, they must be interpreted. In this article we discuss acceptable sufficiency levels for macronutrients, differences between test results from different labs and year-to-year variations.

Review of SLAN approach

Chemical extractants used in the SLAN approach to soil testing do not remove the total quantity of a particular nutrient. Rather, the fraction that is potentially available to the plant over the growing season is removed for analysis; it extracts a "quantity" of plant-available nutrients. For example, on a soil sample from a sand green, the lab used Mehlich III extractant and found that extractable potassium was 20 parts per million (ppm) (= 20 milligrams/kilogram). The total potassium contained in all soil minerals and organic matter would be much higher than the amount that is extractable and available to the plant. Various soil fractions that contribute to plant-available nutrients are noted in the companion paper (3).

Superintendents often ask what this value (quantity of potassium) means. Is the plant-available potassium level in the soil low, medium or high? For the Mehlich III extractant, this level of potassium (20 ppm) on a high-sand green would be ranked "low" based on the rankings in Table 1 (4,5,6,7).

- *Low* range: a high probability (80–100%) that applying the nutrient will elicit a growth response
- *Medium* range: approximately a 50% chance of getting a plant growth response from application of the nutrient; if supplemental fertilizer is not applied, growth will probably be limited, especially as the

KEY points

More info: www.gcsaa.org

Sound interpretation of data from soil test reports is important.

Superintendents must know the extractant used for each nutrient, the medium SLAN ranges and the numerical value for each nutrient.

Given the correct soil test results, a superintendent can estimate the amount of each nutrient needed by the soil.

Figure 1. If two different labs used two different extractants on two halves of a soil sample, both tests should produce approximately the same ranking if the extractants are reliable — even if the numbers differed.

GCSAA *GCM Magazine*, January 2004

List of ranges

- low
- medium
- high

“Low range: a high probability (80-100%) that applying the nutrient will elicit a growth response.”

“Medium range: approximately a 50% chance of getting a plant growth response ...; if supplemental fertilizer is not applied, growth will probably be limited, especially as the season progresses.”

“High range: little or no crop response is expected from applying the particular nutrient.”

Conventional guidelines are *broken*

What’s the objective of turfgrass management?

Royal Bangkok Sports Club, Thailand

Increasing the growth rate

Kashima Soccer Stadium, Japan

Decreasing the growth rate

Manila American Cemetery, Philippines

Adjusting the growth rate

The Old Course, St. Andrews

“Turfgrass management is managing the growth rate of the grass to create the desired playing surface for …” – *Micah Woods*

“The fundamental principle of successful greenkeeping is the recognition of the fact that the finest golfing grasses flourish on poor soil and that more harm is done by over-, rather than underfertilizing.” – *Alister MacKenzie*

Turfgrass management, or *agronomy*?

“In some cases, turfgrasses have been placed in a ‘high’ P and K requirement category, while pasture grasses were in a ‘low’ category. This decision was based on economics, not agronomics. The cost of fertilization was not considered of primary importance for turf.” – *Carrow, Waddington, and Rieke*

And grass is often grown in sand

“Turfgrass researchers continue to improve the soil testing recommendations, but that type of research is time consuming and expensive. It is also worth noting that every time a researcher conducts one of these studies, they tend to find that the levels required are lower than what we previously thought – meaning that ‘low potassium’ you got on your last soil test report might be optimum down the road.” – *Doug Soldat*

The MLSN guidelines address these problems

“I recommend you compare your results with PACE Turf’s Minimum Levels for Sustainable Nutrition [MLSN] guidelines … the minimum levels published by PACE are drastically lower than many traditional soil test interpretations, and likely more accurate.” – *Doug Soldat*

The MLSN guidelines address these problems

Reference

September, 2014

Minimum Levels for Sustainable Nutrition Soil Guidelines

The Minimum Level for Sustainable Nutrition (MLSN) Guideline is a new, more sustainable approach to managing soil nutrient levels that can help you to decrease fertilizer inputs and costs, while still maintaining desired turf quality and playability levels. The MLSN guidelines were developed in a joint project between PACE Turf and the Asian Turfgrass Center. All soil analyses were conducted at Brookside Laboratories, New Bremen, OH.

	MLSN Soil Guideline
pH	>5.5
Potassium (K ppm)	37
Phosphorus (P ppm)	21
Calcium (Ca ppm)	331
Magnesium (Mg ppm)	47
Sulfur as sulfate (S ppm)	7

Nitrogen requirements are best determined based on **turf growth potential**, which incorporates site-specific weather and turf type to calculate nitrogen demand (Gelernter and Stowell, 2005. Golf Course Management, p. 108-113, March, 2005).

How the guidelines were developed

From a database of over 17,000 soil samples, we selected 3,721 that were classified as having:

- not poor performing turfgrass
- pH 5.5 – 8.5; to avoid aluminum toxicity at pH less than 5.5, and to avoid alkalinity hazard at pH greater than 8.5
- total exchange capacity <6 cmol/kg

A log-logistic model provided a significant fit of the data, and was used to identify the concentration (in ppm) of each nutrient that 10% of the soil samples fell below, but were still performing well. This 10th percentile value is the MLSN soil guideline shown above.

For more information, see the Facebook MLSN page at: www.facebook.com/mlsnturf

PACE TURF

ASIAN TURFGRASS CENTER

version 14091801

Using MLSN

Let’s make sure we have enough beer

More specifically...

One can express the quantity of an element required as fertilizer as Q.

$$a + b - c = Q$$

where,

a is the quantity of the element used by the grass
b is the quantity of the element kept in the soil
c is the quantity of the element present in the soil
Q is the quantity of the element required as fertilizer

MLSN is a value for b

$$\overbrace{a+b}^{\text{amount needed}} - \overbrace{c}^{\text{amount present}} = \overbrace{Q}^{\text{fertilizer requirement}}$$

a is a site-specific use estimate, b is the MLSN guideline, and c is the soil test result.

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Link to slides and additional information